ORIGINAL

Before the
**FEDERAL COMMUNICATIONS COMMISSION**
Washington, D.C. 20554



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| In the Matter of | ) | |
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| Amendment of Parts 2 and 15 | ) | |
| of the Commission's Rules to Permit | ) | ET Docket No. 94-124 |
| Use of Radio Frequencies Above 40 GHz | ) | RM-8308 |
| for New Radio Applications | ) | |

# COMMENTS OF TELEDESIC CORPORATION

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January 30, 1995

## SUMMARY

Teledesic Corporation ("Teledesic") is commenting on the Federal Communications Commission ("FCC" or "Commission") proposal to open for commercial development and use portions of the "millimeter wave" frequency bands above 40 GHz. The FCC proposes to make available 2 GHz of spectrum in the 40.5 - 42.5 GHz ("41 GHz") band for non-government uses technically and operationally similar to those proposed in the 27.5-29.5 GHz ("28 GHz") band for local multipoint distribution service ("LMDS").

Teledesic and other United States companies have filed applications with the FCC seeking authorization to construct, launch, and operate global space systems in the 27.5-30.0 GHz band ("the Ka band"). For over two years, the FCC has been evaluating a proposal to redesignate a substantial portion of the Ka band (i.e., the 27.5-29.5 GHz band) for LMDS. Because it now is clear that LMDS is technically incompatible with the use of the Ka band by the global space systems proposed by United States companies, the FCC is now faced with difficult questions in its proceeding concerning the possible redesignation of the 27.5-29.5 GHz band to LMDS. Teledesic applauds the FCC's current proposal to redesignate the 41 GHz band for an LMDS-like service referred to as Licensed Millimeter Wave Service ("LMWS") and urges the FCC to adopt this proposal in lieu of redesignating any portion of the Ka band for LMDS. By designating the 41 GHz band instead of a portion of the Ka band for LMDS, the FCC will preserve the availability of the Ka band for the deployment of global, interactive broadband satellite systems while ensuring the orderly development and deployment of terrestrial LMDS for the benefit of the citizens of the United States.

According to Vice President Gore, the "most important principle" of the Global Information Infrastructure ("GII") is to ensure universal service so that the GII is available to all members of our societies." Perhaps the central policy dilemma in the GII is how to expand the scope of universal service to include broadband capability while also placing greater reliance on market forces. The solution lies in devising technical means to provide affordable access to advanced broadband capability to all those rural and remote parts of the U.S. and the world that would not be economic to serve through traditional wireline means. Promoting the deployment of global, broadband low-Earth orbit ("LEO") satellite systems like Teledesic in the Ka band will ensure that true universal service is available at affordable prices to all the world's citizens regardless of geographic location.

Outside of the urban areas of the United States and other developing countries, and perhaps a few major cities in the developing world, most of the world including rural and remote portions of the United States will receive affordable access to advanced information services only through a satellite-based broadband network. The vast untapped potential of global, broadband satellite systems should not be constrained by short-sighted regulatory actions before the benefits of such services can be realized. To ensure seamless compatibility with the fiber and coaxial networks, a broadband satellite system should have the same essential characteristics as these networks, including high-bandwidth channels, low error rates and low delay. Non-geostationary (non-GEO") broadband satellite systems like the system

proposed by Teledesic, with their low altitude, are able to overcome the problem of time delay in signal transmission to accommodate real-time applications. Low altitude also reduces signal loss and terminal power requirements. Global, broadband satellite systems inherently offer the same quality and capacity to users in the developing world as they do to users in the most advanced markets. In this sense, non-GEO satellite systems are a fundamentally egalitarian technology that promises to radically transform the economics of telecommunications infrastructure.

Wireline technologies are really just a further extension of the industrial age paradigm where people are driven by the economics of infrastructure into overcrowded, overburdened urban congregations. Especially in the developing world, this model is becoming increasingly untenable. As information becomes increasingly essential to all those things we associate with quality of life -- education, health care, economic development, public services -- there is a real danger that the quality of life will not progress, and may even decline, in those areas without a digital broadband infrastructure. As George Gilder has recognized, Teledesic's broadband satellite system will positively and dramatically alter the industrial paradigm by eliminating the differences among regions in access to cultural and information resources such that people will be able to live and work where they want rather than where corporations locate them. Because non-GEO satellite systems are inherently global, they will provide service to all areas of the world, including those places to which no one would extend service for its own sake. As long as demand justifies such systems economically, their "externalities" offer the potential for vast humanitarian benefit to all the world. As Gilder so aptly noted in describing the public benefits of the Teledesic system, these global systems can help solve the "chicken-and-egg" dilemma in economic development. Of course, Teledesic alone is not the full embodiment of the potential of satellite services in the Ka band. Instead, it is merely representative of what would be foreclosed if the United States authorizes an incompatible terrestrial service like LMDS in the bands internationally allocated to the FSS.

Non-GEO satellite systems are intrinsically global in scope and require a global allocation of spectrum. The Ka band was allocated internationally to the fixed satellite service ("FSS") at the 1971 World Administrative Radio Conference and is the only portion of the spectrum that presently can accommodate a global, interactive broadband satellite system. In 1993, the FCC proposed to redesignate the lower 2 GHz of the Ka band (i.e., 27.5-29.5 GHz) to LMDS. Because of serious concerns over whether the proposed LMDS and FSS both could operate in the 27.5-29.5 GHz band, the Commission initiated a negotiated rulemaking proceeding in 1994 to determine whether co-frequency sharing of the 27.5 to 29.5 GHz band between the FSS and the proposed LMDS was possible. Despite the hard work of the Negotiated Rulemaking Committee ("NRMC"), because of the overwhelming interference between the FSS and the proposed LMDS, the NRMC could not find a means to accommodate co-frequency sharing between the FSS and the proposed LMDS.

Because co-frequency sharing of the Ka band is not possible, the FCC is now faced with a dilemma. Unless other spectrum is made available for LMDS, the FCC may be forced to address this problem either by segmenting the Ka band between satellite services and

LMDS or permitting only one of the services to use the 2 GHz band of Ka band spectrum. None of the options identified by the FCC maximizes choices for consumers. Segmentation will prevent both services from realizing their full potential; allocating the spectrum exclusively only to one service allows the chosen service to realize its potential at the expense of the other.

Faced with these choices, the decision for the FCC is quite clear. The use of any part of the 28 GHz band for LMDS would not serve the public interest because it not only would render that spectrum unusable for FSS earth-to-space transmissions but also would render unusable the companion spectrum at 17.7-19.7 GHz used for FSS space-to-earth links. The purported benefits of a redundant local broadcast technology like LMDS are insignificant compared to the vast social and economic benefits that can be brought about by global, interactive broadband satellite systems. Line-of-sight limitations and the propagation characteristics of the Ka band constrain LMDS cell size. With a rigidly-constrained cell size, the economics of LMDS favor the dedication of service to urban areas with high concentrations of potential subscribers. These are precisely the areas that already have access to cable television service, direct broadcast satellite service, multichannel multipoint distribution service, satellite master antenna television service, and soon video dial tone from various telephone companies. While LMDS might represent an opportunity for its promoters, the net economic benefit to society would be decidedly negative if it precludes the full potential of global, interactive broadband satellite systems in the Ka band.

The instant proceeding provides the FCC with the opportunity to break the impasse in the proceeding on the future use of the Ka band that presently exists. Designating the 41 GHz band to LMDS will create a win-win situation for all affected parties by providing LMDS proponents with the amount of spectrum they claim to require to operate their broadcast-type terrestrial service, while preserving the use of the Ka band for global, interactive broadband satellite systems operating in the FSS. Importantly, such action would be consistent with the worldwide allocation in 1971 of the Ka band to FSS. In addition, redesignating the 41 GHz band to LMDS is consistent with the international table of allocations and would bring the United States into conformance with Europe where spectrum in the 41 GHz band is allocated for LMDS-type service.

Teledesic has reviewed whether operation of the proposed LMDS in the 41 GHz band is technically comparable to operation in the Ka band and its study confirms that the FCC's approach is both feasible and technically sound. Based on Teledesic's technical review, LMDS operation in the 41 GHz band is technically comparable to such operation in the Ka band and is readily achievable from both a propagation standpoint and an equipment standpoint. The propagation characteristics of LMDS operations in the Ka band and in the 41 GHz band are similar. Thus, deployment of LMDS in the 41 GHz band rather than in the Ka band will not pose additional technical or economic burdens on LMDS operators. For LMDS systems operating in the 41 GHz band, the atmospheric attenuation due to water vapor and oxygen, and the signal attenuation caused by rain are very similar to the attenuation predicted for LMDS operations in the nearby Ka band. Teledesic's review also indicates that

equipment necessary to implement LMDS at 41 GHz is comparable to that proposed to be employed for LMDS at 28 GHz. Teledesic is confident that the ingenuity of the United States and foreign equipment manufacturers will enable them to quickly produce 41 GHz LMDS equipment at costs comparable to the costs projected for 28 GHz LMDS equipment.

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# COMMENTS OF TELEDESIC CORPORATION

To: The Commission

## I. INTRODUCTION

Teledesic Corporation ("Teledesic"), by its attorneys and pursuant to Section 1.415 of the Rules and Regulations of the Federal Communications Commission ("FCC" or "Commission"), 47 C.F.R. §1.415, respectfully submits the following comments in response to the Commission's Notice of Proposed Rulemaking in the above-captioned proceeding.1/ The Commission proposes to open for commercial development and use portions of the "millimeter wave" frequency bands above 40 GHz. The FCC has specifically propose to make available 2 GHz of spectrum in the 40.5 - 42.5 GHz ("41 GHz") band for non-government uses technically and operationally nearly identical to those proposed in the 27.5-29.5 GHz ("28 GHz") band for local multipoint distribution service ("LMDS"). 40 GHz NPRM.2/

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1/ Amendment of Parts 2 and 15 of the Commission's Rules to Permit use of Radio Frequencies above 40 GHz for New Radio Applications, 59 Fed. Reg. 61304 (released Nov. 30, 1994) ("40 GHz NPRM").

2/ In the 40 GHz NPRM, the FCC also proposes to provide spectrum for unlicensed terrestrial services in the 59-64 GHz band. In its application seeking an authorization to construct, launch and operate a low-Earth orbit satellite system, Teledesic proposes using the 59.5-60.5 GHz and the 62.5-63.5 GHz bands for its intersatellite links because the 59-64 GHz band is allocated on an international basis to intersatellite service.

Teledesic and other United States companies have filed applications with the FCC seeking authorization to construct, launch, and operate global space systems in the 27.5-30.0 GHz band ("the Ka band"). For over two years, the FCC has been evaluating a proposal to redesignate a substantial portion of the Ka band (i.e., the 27.5-29.5 GHz band) for LMDS. Rulemaking to Amend Part 1 and Part 21 of the Commissions Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Service, 8 FCC Rcd 557 (1993) ("First Notice"). Because it now is clear that LMDS is technically incompatible with the use of the Ka band by the global space systems proposed by United States companies, the FCC is now faced with difficult questions in its proceeding concerning the possible redesignation of a portion of the 27.5-29.5 GHz band to LMDS. Teledesic applauds the FCC's current proposal to redesignate the 41 GHz band for an LMDS-like service referred to as Licensed Millimeter Wave Service ("LMWS") and urges the FCC to adopt this proposal in lieu of redesignating any portion of the Ka band for LMDS. By designating the 41 GHz band instead of a portion of the Ka band for LMDS, the FCC will preserve the availability of the Ka band for the deployment of global, interactive broadband satellite systems while ensuring the orderly development and deployment of terrestrial LMDS for the benefit of the citizens of the United States.

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Application of Teledesic Corporation for a Low-Earth Orbit Satellite System in the Fixed Satellite Service, Appendix 2, RF Plan, at 132 (filed March 21, 1994). Teledesic supports this change provided the FCC prohibits unlicensed terrestrial services operating in such bands from interfering with intersatellite links such as those proposed by Teledesic.

## II. DISCUSSION

### A. Global Broadband Satellite Systems are Essential to Ensure Universal Service to Advanced Information Services for All People of the United States and the World

According to Vice President Gore, the "most important principle" of the Global Information Infrastructure ("GII") "is to ensure universal service so that the GII is available to all members of our societies." Vice President Gore, Speech to the World Development Conference, at 5 (March 21, 1994) ("Gore GII Speech"); see Hundt, Speech to the World Development Conference, at 4 (March 22, 1994) ("Hundt GII Speech"); see also Vice President Gore, Remarks Prepared for Delivery by Vice President Al Gore, Royce Hall, UCLA, Los Angeles, California, at 8-9 (Jan. 11, 1994) (a goal of the NII is to extend the concept of universal service to ensure information resources are available to all Americans at reasonable prices). Perhaps the central policy dilemma in the GII is how to expand the scope of universal service to include broadband capability while also placing greater reliance on market forces. The solution lies in devising technical means to provide affordable access to advanced broadband capability to all those rural and remote parts of the U.S. and the world that would not be economic to serve through traditional wireline means. Promoting the deployment of global, broadband low-Earth orbit ("LEO") satellite systems like Teledesic in the Ka band will ensure that true universal service is available to all the world's citizens at affordable prices regardless of geographic location. As the Vice President recognized:

> Constellations of hundreds of satellites in low-Earth orbit may soon provide telephone or data services to any point on the globe. Such systems could make universal service both practical and affordable.

Gore GII Speech, at 5; see also Chairman Hundt, Testimony of Reed E. Hundt, Chairman, Federal Communications Commission Before the House Subcommittee on Telecommunications on the Global Information Infrastructure and the Role of Satellites, 1994 FCC Lexis 3729, at 16-17 (July 28, 1994) ("Satellite Testimony").

For more than three decades, satellite systems have been a crucial means for delivering telecommunications services to people throughout the world. Satellite services continue to grow in importance as the role of telecommunications in the daily lives of the world's citizens expands through greater reliance on advanced voice and data communications. Traditional wireline technologies are unable to deliver even the most basic telecommunications services to most of the remote and rural regions of the world. As Chairman Hundt has aptly noted, many countries, particularly in the developing world, would have a very limited long distance network and would be virtually cut off from international communications, were it not for satellites. See Satellite Testimony, 1994 FCC Lexis at 2.

Most of the world's citizen will never have access to advanced, digital broadband information capabilities through a wireline infrastructure. In fact, most of the world now does not have access even to the most basic voice service. Over half of the world's population lives more than two hours from a telephone, and vast regions of the developing world are completely without telephones. Moreover, even where basic telephone service is available, the networks over which it is provided are frequently antiquated and in need of modernization. The problem is even more acute with respect to advanced information services. Indeed, even in the United States many rural exchanges cannot reliably transmit facsimile or other low-rate data traffic with existing facilities. The cost to upgrade such

facilities through conventional wireline means will be prohibitive for many rural wireline exchanges. Outside of the urban areas of the United States and other developed countries, and perhaps a few major cities in the developing world, most of the world including rural and remote portions of the United States will receive affordable access to advanced information services only through a satellite-based broadband network.

The vast untapped potential of global, broadband satellite systems should not be constrained by short-sighted regulatory actions before the benefits of such services can be realized. It is too early to predict with certainty what applications and data protocols a broadband satellite system will be called upon to accommodate in the 21st century. However, it is reasonable to assume that these applications will be developed for the terrestrial fiber and coaxial networks serving the advanced, urban areas of the developed world. To ensure seamless compatibility with the fiber and coaxial networks, a broadband satellite system should have the same essential characteristics as these networks. Those essential characteristics include high-bandwidth channels, low error rates and low delay.

Traditional geostationary ("GEO") communications satellites, orbiting as much as 50 times further from the Earth than non-geostationary ("non-GEO") satellites, will never be able to satisfy the low delay requirement. By contrast, non-GEO broadband satellite systems like the system proposed by Teledesic, with their low altitude, are able to overcome the problem

of time delay in signal transmission to accommodate real-time applications.3/ Low altitude also reduces signal loss and terminal power requirements.

Because non-GEO satellites move in relation to a given point on the Earth, coverage of any location on the Earth requires, in essence, coverage of every place on the Earth. Thus, these global, broadband satellite systems inherently offer the same quality and capacity to users in the developing world as they do to users in the most advanced markets. In this sense, non-GEO satellite systems are a fundamentally egalitarian technology that promises to to radically transform the economics of telecommunications infrastructure.

To fully realize Vice President Gore and Chairman Hundt's vision for the NII and GII, the deployment of global broadband satellite systems is essential. In describing the importance of such systems to the NII and GII and the virtues of the Teledesic system, George Gilder stated that Teledesic would transform:

> the dimensions of the world as decisively as trains, planes, automobiles, phones and TVs changed them in previous eras. It will extend 'universal service' more dramatically than any new law can.

Gilder, Telecosm Ethersphere, Forbes ASAP, at 133, 146 (Oct. 10, 1994) ("Telecosm Article") (attached hereto as Appendix B).

In recognizing the ability of Teledesic to meet the Vice President's universal service objective, Gilder also observed:

> Teledesic can eliminate the need to cross-subsidize rural customers. Determining the cost of wireline services are the parameters of population density and distance from the

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3/ The evolution from centralized to decentralized networks that is taking place in space is analagous to what has occurred previously with terrestrial networks. Computer networks have evolved from centralized systems, where all the system assets are centralized in a single mainframe computer, to decentralized networks of interconnected personal computers. Similarly, satellite-based networks are evolving from centralized networks, consisting of single GEO satellites, to networks of interconnected non-GEO satellites.

> central office. Rural customers now cost between 10 and 30 times as much to serve with wires as urban customers do. Teledesic will bring near broadband capabilities to everyone in the world at the same price.

Telecosm Article, at 146.

Wireline technologies are really just a further extension of the industrial age paradigm where people are driven by the economics of infrastructure into overcrowded, overburdened urban congregations. Especially in the developing world, this model is becoming increasingly untenable. To the extent the information revolution is based on fiber, the "information highway" metaphor is apt. Like a highway, or the railways before them, fiber is rigidly dedicated to a particular location. If a town is near the mainline, it prospers; if it is a few miles distant, it dries up and blows away. As information becomes increasingly essential to all those things we associate with quality of life -- education, health care, economic development, public services -- there is a real danger that the quality of life will not progress, and may even decline, in those areas without a digital broadband infrastructure. Without the deployment of broadband satellite systems, those areas that will suffer will include most of the world and most of its citizens. As George Gilder has recognized, Teledesic's broadband satellite system will positively and dramatically alter the industrial paradigm:

> [N]o terrestrial system will cover the entire world, or even the entire U.S., within decades of Teledesic. As soon as it is deployed, it will profoundly change the geography and topography of the globe. Suddenly, the most remote rural redoubt, beach or mountain will command computer communications comparable to urban corporations today. The system can make teleconferencing, telecommuting, telemedicine, and teleschooling possible anywhere. Gone will be the differences among regions in access to cultural and information resources. People will be able to live and work where they want rather than where corporations locate them.

Telecosm Article, at 146.

Because non-GEO satellite systems are inherently global, they will provide service to all areas of the world, including those places to which no one would extend service for its own sake. As long as demand on a global basis justifies such systems economically, their "externalities" offer the potential for vast humanitarian benefit to all the world. As Gilder so aptly noted in describing the public benefits of the Teledesic system, these global systems can help solve the "chicken-and-egg" dilemma in economic development:

> Most important, this expansion of the communications frontier will foster the very economic development that will fuel the demand for the service. Today, it does not pay to bring telecommunications to poor countries that might benefit most. Teledesic and other satellite services break the bottleneck of development. Simultaneously opening the entire world, it enriches every nation with new capital exceeding the fruits of all the foreign aid programs of the era.

Telecosm Article, at 146. Of course, Teledesic alone is not the full embodiment of the potential of satellite services in the Ka band. Instead, it is merely representative of what would be foreclosed if the United States authorizes an incompatible terrestrial service like LMDS in the bands internationally allocated to the FSS.

### B. Redesignation of the 40.5 - 42.5 GHz Band to LMDS Will Foster the Full Deployment of Terrestrial Domestic LMDS and Global, Broadband Satellite Systems

Non-GEO satellite systems are intrinsically global in scope and require a global allocation of spectrum. The Ka band was allocated internationally to the fixed satellite service ("FSS") at the 1971 World Administrative Radio Conference and is the only portion of the spectrum that presently can accommodate a global, interactive broadband satellite system. In 1993, the FCC proposed to redesignate the lower 2 GHz of the Ka band (i.e., 27.5-29.5 GHz) to LMDS. First Notice; see also Rulemaking to Amend Part 1 and Part 21 of the

Commission's Rules to Redesignate the 27.5 - 29.5 GHz Frequency Band and to Establish Rules and Policies for Local Multipoint Distribution Services, 9 FCC Rcd 1394 (1994) ("Second Notice"). Because of serious concerns over whether the proposed LMDS and FSS both could operate in the 27.5-29.5 GHz band, the Commission initiated a negotiated rulemaking proceeding in 1994 to determine whether co-frequency sharing of the 27.5 to 29.5 GHz band between the FSS and the proposed LMDS was possible. Notice of Advisory Committee Established, 59 Fed. Reg. 33483 (June 29, 1994).4/ Despite the hard work of the Negotiated Rulemaking Committee ("NRMC"), because of the overwhelming interference between the FSS and the proposed LMDS, the NRMC could not find a means to accommodate co-frequency sharing between the FSS and the proposed LMDS. Report of the LMDS/FSS 28 GHz Band Negotiated Rulemaking Committee, at 85-86 (Sept. 23, 1994) ("NRMC Report").

Because co-frequency sharing of the Ka band is not possible, the FCC is now faced with a dilemma. Unless other spectrum is made available for LMDS, the FCC may be forced to address this problem either by segmenting the Ka band between satellite services and LMDS or permitting only one of the services to use the 2 GHz band of Ka band spectrum. Second Notice. None of the options identified in the Second Notice for resolving the incompatibility of LMDS operation in the Ka band with FSS operation there maximizes choices for consumers. Segmentation will prevent both services from realizing their full

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4/ All interested parties, including Teledesic Corporation, Hughes Space and Communications Co., CellularVision of New York, L.P. ("CellularVision") and Video/Phone, Systems Inc. ("Video/Phone") participated on the NRMC.

potential; allocating the spectrum exclusively only to one service allows the chosen service to realize its potential at the expense of the other.

Faced with the choices described in the Second Notice, the decision for the FCC is quite clear. The use of any part of the 28 GHz band for LMDS would not serve the public interest because it not only would render that spectrum unusable for FSS earth-to-space transmissions but also would render unusable the companion spectrum at 17.7-19.7 GHz used for FSS space-to-earth links. Furthermore, the purported benefits of a redundant local broadcast technology like LMDS are insignificant compared to the vast social and economic benefits that can be brought about by global, interactive broadband satellite systems. Line-of-sight limitations and the propagation characteristics of the Ka band constrain LMDS cell size. With a rigidly-constrained cell size, the economics of LMDS favor the dedication of service to urban areas with high concentrations of potential subscribers. These are precisely the areas that already have access to cable television service, direct broadcast satellite service, multichannel multipoint distribution service, satellite master antenna television service, and soon video dial tone from various telephone companies.5/ While LMDS might represent a profit opportunity for its promoters, the net economic benefit to society would be decidedly negative if it precludes the full potential of global, interactive broadband satellite systems in the Ka band.

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5/ The FCC itself has recognized that there now is vigorous competition among multichannel providers of video programming. Based in part on this plethora of competition, the FCC has instituted several major proceedings to reexamine several of its broadcast rules with an eye toward relaxation. See e.g., Review of the Commission's Regulations Governing Television Broadcasting, Notice of Proposed Rulemaking, FCC 94-322, at 27 (released Jan. 17, 1995); Review of the Commission's Regulations Governing Attribution of Broadcast Interests, Notice of Proposed Rulemaking, FCC 94-324, at 7 (released Jan. 12, 1995).

Teledesic believes the instant proceeding provides the FCC with the opportunity to break the impasse in the proceeding on the future use of the Ka band that presently exists. Designating the 41 GHz band to LMDS will create a win-win situation for all affected parties by providing LMDS proponents with the amount of spectrum they claim to require to operate their broadcast-type terrestrial service, while preserving the use of the Ka band for global, interactive broadband satellite systems operating in the FSS. Importantly, such action would be consistent with the worldwide allocation in 1971 of the Ka band to FSS. In addition, redesignating the 41 GHz band to LMDS is consistent with the international table of allocations and would bring the United States into conformance with Europe where spectrum in the 41 GHz band is allocated for LMDS-type service.

In the United Kingdom, the decision to use the 41 GHz band for Multipoint Video Distribution Systems ("MVDS"), as LMDS is known there, was made in 1989. The Radio Communications Agency in the United Kingdom already has authorized an analog MVDS to begin operation in the 41 GHz band.6/ The system is expected to be operational this year. Moreover, in 1994, a working group was formed in the United Kingdom to develop requirements and specifications for a digital interactive MVDS. The Conference on European Posts and Telecommunications has adopted the 41 GHz band for MVDS in order to harmonize use across Europe, with the objective of providing economies of scale in equipment manufacture.

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6/ The specification for the system was developed by a group of regulators, terrestrial microwave operators, semiconductor manufacturers, and microwave component and antenna manufacturers who met between November 1990 to January 1993.

By maintaining the harmony and compatibility of United States uses of spectrum with international uses, U.S. terrestrial and satellite equipment providers and satellite and terrestrial service providers will have maximum access to global markets. Having the same spectrum allocation for LMDS in the United States as in Europe will create export opportunities for U.S. manufacturers of LMDS equipment who can establish a world leadership position in LMDS technology. To maximize the public benefits of both the FSS and the proposed LMDS, the Commission should seize the opportunity available to it in this proceeding for the optimum development of both global, broadband satellite systems in the FSS and LMDS by redesignating the 41 GHz band to the latter and preserving the Ka band for the former.

### C. Operation of the Proposed LMDS in the 40.5 - 42.5 GHz Band is Technically and Economically Comparable to Operation in the Ka Band

In the 40 GHz NPRM, the Commission seeks comment on designating the entire 41 GHz band for licensed uses that are likely to be technically and operationally similar to those proposed in the Ka band for LMDS. 40 GHz NPRM, at 9-11. The FCC plans to model the licensing rules for the millimeter bands, including the 41 GHz band, on the rules and procedures proposed for LMDS and comments are requested on any modification to the proposed LMDS rules that may be appropriate in the licensing of the millimeter spectrum. 40 GHz NPRM, at 11, citing First Notice. Specifically, the FCC has proposed creation of a 2 GHz band at the 41 GHz band which would be divided into two license blocks of 1000 MHz for exclusive assignment in each licensed area.

Teledesic has reviewed whether operation of the proposed LMDS in the 41 GHz band is technically and economically comparable to operation in the Ka band and its study confirms

that the FCC's approach is both feasible and technically sound. As demonstrated in the attached report, LMDS operation in the 41 GHz band is technically comparable to such operation in the Ka band and is readily achievable from both a propagation standpoint and an equipment standpoint. Teledesic, LMDS is Feasible in the 40.5 - 42.5 GHz Band, (Jan. 25, 1995) ("LMDS Report") (attached hereto as Appendix A). As demonstrated below, the propagation characteristics of LMDS operations in the Ka band and in the 41 GHz band are similar. Thus, deployment of LMDS in the 41 GHz band rather than in the Ka band will not pose additional technical or economic burdens on LMDS operators. For LMDS systems operating in the 41 GHz band, the atmospheric attenuation due to water vapor and oxygen, and the signal attenuation caused by rain are very similar to the attenuation predicted for LMDS operations in the nearby Ka band. Teledesic's review also indicates that equipment necessary to implement LMDS at 41 GHz is comparable to that proposed to be employed for LMDS at 28 GHz. Teledesic is confident that the ingenuity of the United States and foreign equipment manufacturers will enable them to quickly produce 41 GHz LMDS equipment at costs comparable to the costs projected for 28 GHz LMDS equipment.

LMDS Operation in the 41 GHz Band is Technically Comparable to Ka Band Operation from a Propagation Standpoint. Teledesic examined the effect of propagation on LMDS if it is operated at 41 GHz rather than 28 GHz and confirmed that the proposed LMDS use of the 41 GHz band is technically comparable to a Ka band operation from a propagation standpoint. LMDS Report, at 3. Teledesic's review establishes that there is virtually no difference in the operation of LMDS in the higher frequency band. Teledesic first examined the propagation effects that vary with the frequency employed: attenuation due

to gasses and attenuation due to precipitation. A comparison of attenuation caused by water vapor and gasses between LMDS operations in the Ka band and in the 41 GHz band reveal insignificant differences in propagation between the LMDS operations. See id. Atmospheric attenuation due to water vapor is approximately the same for an LMDS system operating in the 41 GHz band as with one operating in the Ka band. Id. A typical value is 0.06 dB/km. Id. Atmospheric attenuation due to oxygen is also minimal. Teledesic's study demonstrates that atmospheric attenuation due to oxygen is approximately 0.04 dB/km at 41 GHz versus 0.014 dB/km at the Ka band. Id. Even using the assumption of the principal LMDS proponent that the radius of an LMDS cell will be three miles, the increased attenuation due to water vapor and oxygen absorption at 41 GHz versus 28 GHz is an insignificant 0.14 dB. Id.

Teledesic also has examined the effect of attenuation caused by precipitation on the availability of an LMDS hub to subscriber link. Teledesic's evaluation indicates that when attenuation due to rain is taken into account, there is an insignificant difference in the availability of the LMDS hub to subscriber link at the 41 GHz band as compared to that in the Ka band. LMDS Report, at 4. CellularVision has designed its analog system based on a 99.90% hub to subscriber link availability at the Ka band using a cell with a 3 mile radius. Based on Teledesic's examination, using the same EIRP at both the Ka band and at 41 Ghz, CellularVision's hub to subscriber link availability is reduced from 99.90% in the Ka band to 99.75 % in the 41 GHz band. Id. at 4. In other words, there is only a minor 0.15% difference in availability due to rain between operation of an LMDS system with a full 3 mile radius at the two frequency bands. Since this difference is technically insignificant, it will

not require any changes in CellularVision's system design and should have no practical effect on subscribers or equipment. This availability figure is above the proven commercially accepted availability standard (i.e., 99.70%) used in the direct broadcast satellite industry. Teledesic's analysis is based on a conservative set of assumptions. A different set of assumptions will establish even a higher availability percentage. CellularVision and other LMDS proponents have acknowledged that LMDS is primarily a urban service. In most environments, line-of-sight limitations, not atmospheric attenuation, will be the limiting factor in cell size determinations. Therefore, in general, LMDS systems will typically employ cells with radii smaller than 3 miles. Assuming a more realistic cell size at the 41 GHz band, such as that proposed by Video/Phone, any signal attenuation will be even less than with a 3 mile cell radius.

LMDS Operation in the 41 GHz Band is Technically Comparable to Ka Band Operation from an Equipment Standpoint. Teledesic also has evaluated the technical comparability of the proposed LMDS operation in the 41 GHz band, as compared to the Ka band, from the prospective of the availability and cost of LMDS equipment. See generally LMDS Report, at 7-11. Teledesic's review indicates that the differences in equipment required to construct and operate a 41 GHz band LMDS system as opposed to a Ka band LMDS system are inconsequential. Id. at 7-8.

Equipment to implement LMDS-type systems at the 41 GHz band is technically comparable to equipment necessary to operate LMDS at the Ka band. The equipment differences between a 41 GHz LMDS system and a 28 GHz LMDS system are minimal. Only the microwave components change. See LMDS Report, at 7-8. The other, much more

costly, elements of the LMDS system remain the same. In the subscriber terminals, only the antenna and the low-noise block converter are different for 41 GHz as opposed to 28 GHz operation. Id. The receiver (IF and demodulator), decoder, user interface, power supply, and case are the same regardless of the band in which the system operates. Id. At the hub transmitter, the only components that are different for 41 GHz versus 28 GHz operation are the upconverter, power amplifier, and antenna. Id. The transmitters (modulators and IFs), encoders, power supplies, equipment racks, site cost, and equipment required to distribute programming to the hub are identical for both 41 GHz and 28 GHz operation. Id. Consequently, there will be little impact on the total cost to build equipment for 41 GHz LMDS service. Id. at 7.

The required equipment for implementation of LMDS depends on the type of service provided to users, the necessary technical and planning parameters, sharing criteria and licensing requirements. See LMDS Report, at 8. The differences in the implementation and equipment costs among the three LMDS systems proposed during the NRMC by CellularVision, Video/Phone and Texas Instruments are greater than the differences between implementing an LMDS system in the the two bands. Id.

Given the few items of equipment in a proposed 28 GHz band LMDS system that would need to be modified if LMDS is authorized in the 41 GHz band, a 41 GHz equipment market is likely to emerge quickly, at no additional expense. Past experience has shown that when the FCC has authorized spectrum for a new service, regardless of the spectrum selected, domestic and foreign equipment manufacturers immediately rise to the occasion to design and manufacture affordable equipment for mass consumption for the newly authorized service.

Additionally, the domestic equipment market should be able to capture the synergies existing between the LMDS-type systems already authorized and planned for operation this year in Europe, actually reducing equipment costs. Quite simply, Teledesic's review confirms that there is nothing magical about operating an LMDS system at the Ka band rather than at the 41 GHz band. LMDS equipment will be manufactured in sufficient quantities and priced for mass consumer use regardless of the spectrum authorized for the service.

## III. CONCLUSION

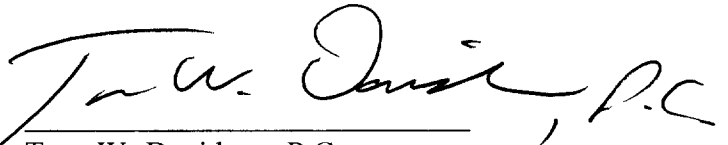
Because of the vigorous disagreement between FSS and LMDS proponents over future use of the Ka band, the FCC has not taken any action to address the legal and technical issues before it in CC Docket No. 92-297 since the conclusion of the NRMC. The instant proceeding eliminates the need for the FCC to resolve the issues being debated over the use of the Ka band by providing it with a solution that will benefit both the FSS and LMDS proponents -- redesignating for LMDS the 41 GHz band instead of a portion of the Ka band. The beauty of this win-win approach is that the same amount of technically comparable spectrum will be available for LMDS in the 41 GHz band as LMDS advocates claim they need in the 28 GHz band under a licensing scheme that is virtually identical to the regulatory framework requested by LMDS proponents in the Ka band. Because LMDS operation in the 41 GHz band is technically comparable to LMDS use in the 28 GHz band from both a propagation and equipment standpoint, the FCC can expeditiously redesignate the 41 GHz band to LMDS and promptly begin the LMDS licensing process. Teledesic supports bifurcation of this proceeding to enable the Commission to immediately address the redesignation of the 41 GHz band for LMDS in the event the FCC will require additional

time to deliberate questions involving the use of bands above 41 GHz for other new services.

Based on the foregoing, Teledesic urges the FCC to redesignate the 41 GHz band for LMDS. The solution proposed by Teledesic will best serve the public interest because it permits the FCC to accommodate both the spectrum requirements of LMDS and the FSS in separate without adversely affecting the deployment of either service.

Respectfully Submitted,

TELEDESIC CORPORATION

By: 

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January 30, 1995

Teledesic

# LMDS is Feasible in the 40.5 - 42.5 GHz Band

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January 25, 1995